

CHAPTER 9 - ATTACHMENT OF CONDUCTORS TO TERMINALS

9.1 General

1. **Minimum Insulation Clearance.** The insulation shall not be imbedded in the solder joint. The contour of the conductor shall not be obscured at the termination end of the insulation.
2. **Maximum Insulation Clearance.** The insulation clearance shall be less than two wire diameters, including insulation, but in no case shall permit shorting between adjacent conductors. Insulation clearance shall be referenced from the first point of contact of the conductor to the terminal.
3. **Multiple Parallel Entry.** For multiple parallel entry of conductors to a terminal, insulation clearances need not be equal.
4. **Variations.** When characteristic impedance or other circuit parameters are affected, as in high-voltage circuits or coaxial line terminations, the insulation clearance requirements may be modified. All variations shall be documented.
5. **Breakouts from Wire Bundles.** For multiple conductors routed from a common wire bundle to equally spaced soldered terminals, the length of the conductor ends, including bend allowance, shall be uniform to prevent stress concentration on any one conductor.
6. **Mechanical Support.** Wire bundles shall be supported so that the solder connections are not subjected to mechanical loads. The methods, means, and location of this support shall be specified on the design engineering documentation.
7. **Stress Relief.** Conductors shall be provided with sufficient slack to preclude tension on the solder termination or conductor.
8. **Wrap Orientation.** Conductors may be wrapped clockwise or counterclockwise on the terminal and shall continue the curvature of the dress. The conductor shall not interfere with the wrapping of other conductors on the terminal. The curvature of the dress shall not exceed 20° from a perpendicular line from the last point of contact between the conductor and terminal (Figure 9-1).

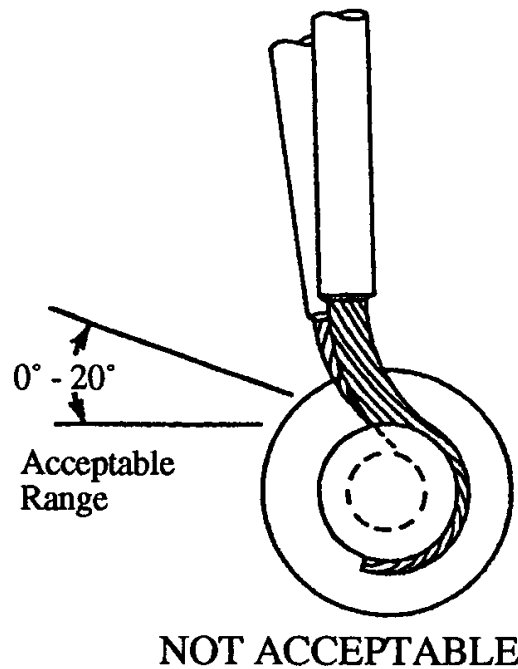


Figure 9-1. Wrap Orientation

9. **Terminal Fill.** Conductors and part leads shall be in full contact with the terminal. They shall not be wrapped onto each other or extend beyond the top of the terminal.

10. **Part Leads.** Part leads shall not be used as terminals unless the part is designed for the lead to function as a terminal.

11. **Mounting of Parts to Terminals.** The mounting of parts shall comply with the requirements of paragraph 8.3 and this chapter.

12. **Terminals.** Hot dipped, tin-lead coated or hot reflowed, electrodeposited tin-lead solder terminals shall be used. Terminals with uneven or excessive coatings on their mounting surfaces shall not be used as they may loosen in subsequent soldering operations. Terminals shall be of proper size to accommodate the conductors. Terminals and conductors shall not be modified except for high voltage applications.

13. **High-Voltage Lead Wrap.** High-voltage lead wraps shall be defined on the engineering documentation.

9.2 Turret and Straight Pin Terminals

1. **Side Route.** The side route shall be connected as follows:

a. Conductor sizes larger than American Wire Gage (AWG) 26 shall be wrapped a minimum of 1/2 (180°) to a maximum of 3/4 turn (270°) around the post (see Figure 9-2A).

b. Conductor sizes AWG 26 and smaller shall be wrapped a minimum of 1/2 turn (180°) but less than one full turn (360°) around the post (see Figure 9-2B).

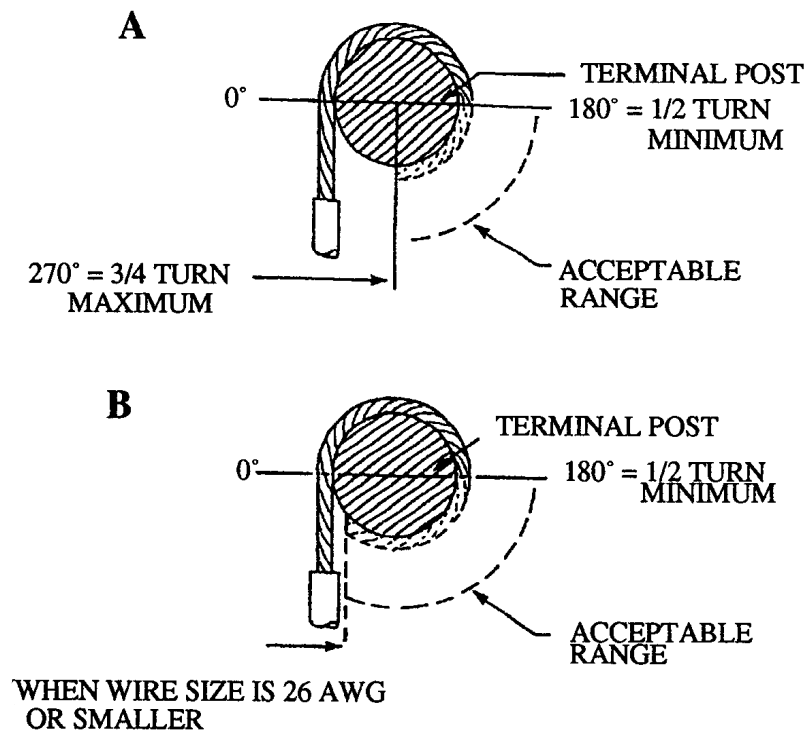


Figure 9-2. Conductor Wrap

c. For turret terminals, all conductors shall be confined to the guide slots (see Figure 9-3A).

d. Conductors shall be maintained in contact with the post for the full curvature of the wrap and the conductor ends shall not extend beyond the base of the terminal.

e. More than one conductor may be installed in a single slot of sufficient height, provided each conductor is wrapped on the terminal post and not on another conductor.

2. **Bottom Route.** The conductor shall enter the terminal from the bottom, be brought through the side slot at the top, and wrapped as required for side route (Figure 9-3B).

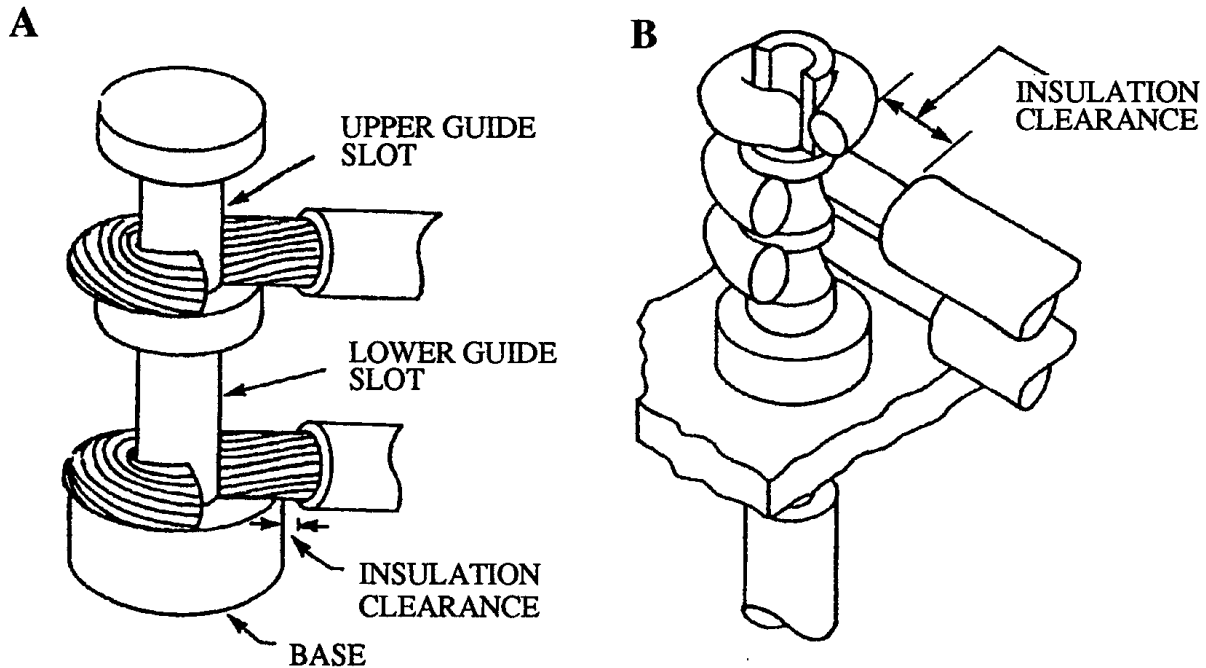


Figure 9-3. Turret Terminal

3. **Continuous Run Wrapping.** If three or more terminals in a row are to be connected, a solid bus wire jumper may be continued from terminal to terminal as shown in Figure 9-4. The wrap to the first and last terminal of the series shall conform to paragraph 9.2-1A or paragraph 9.2-1B depending on the conductor size.

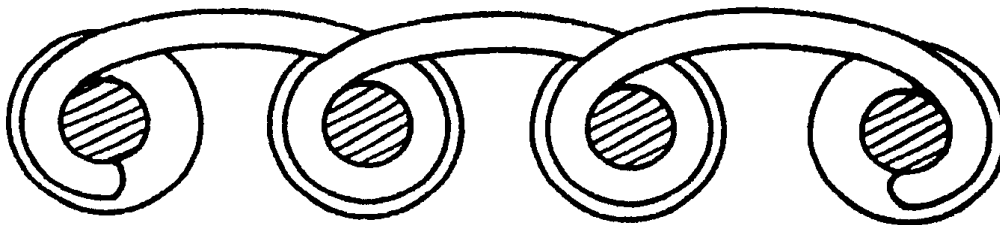


Figure 9-4. Continuous Run Wrapping--Turret Terminals

9.3 Bifurcated Terminals

1. **Bottom Route.** Bottom route shall be connected as shown in Figure 9-5. Conductors shall not extend beyond the diameter of the base of the terminal except where physical clearance is adequate for the intended environment or electrical characteristics. When more than one conductor is to be attached, it shall be inserted at the same time but shall be wrapped separately around alternate posts.

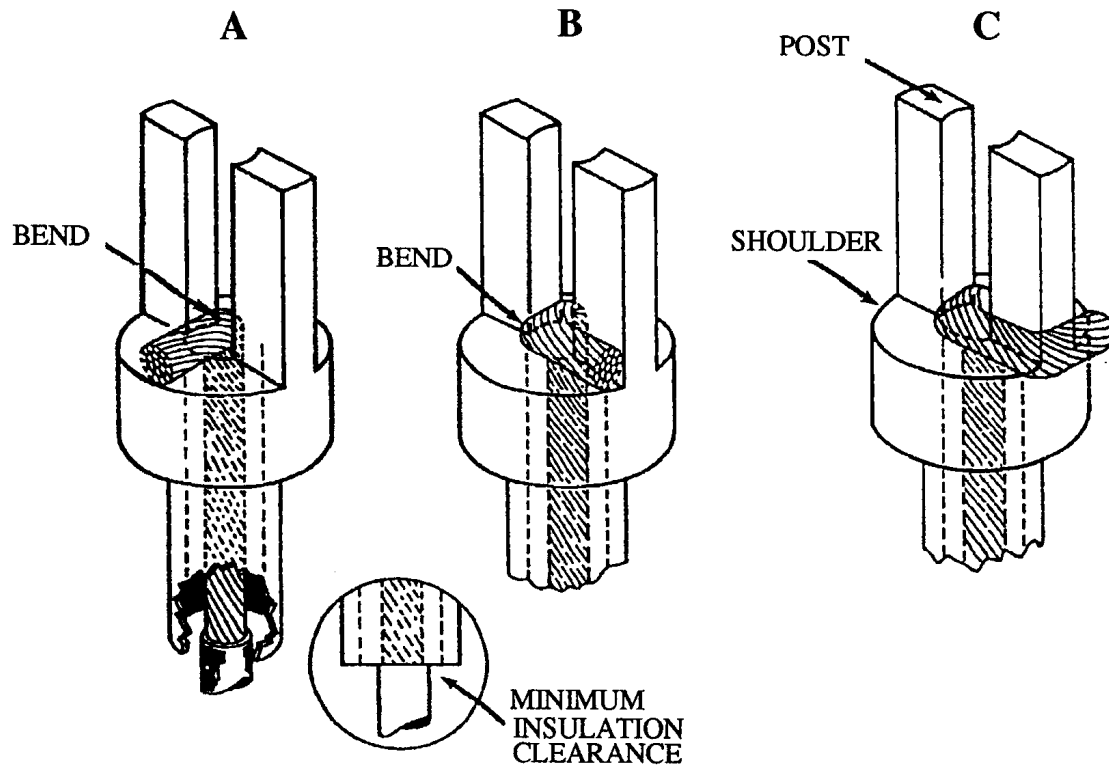


Figure 9-5. Bottom Route Connections to Bifurcated Terminals

2. **Side Route.** Side route shall be connected as follows (Figure 9-6):
 - a. The conductor shall enter the mounting slot perpendicular to the posts.
 - b. A conductor may lay straight through a terminal slot provided the conductor surface remains in contact with the terminal surface (Figure 9-6A). Where conductors are wrapped on a terminal post, they shall wrap a minimum of 90° and a maximum of 180° (1/4 to 1/2 turn); refer to Figure 9-7.
 - c. More than one conductor may be installed on a single post provided each conductor is wrapped on the terminal post and not on another conductor.
 - d. When more than one conductor is connected to a terminal, the direction of bend of each additional conductor shall alternate (Figures 9-6B and D).
 - e. Conductors shall not extend beyond the diameter of the base of the terminal except where physical clearance will not adversely affect environmental or electrical characteristics.
3. **Side and Bottom Route.** The bottom route shall be installed first as shown in Figure 9-5, then the side route as shown in Figure 9-6, methods B, C, or D.

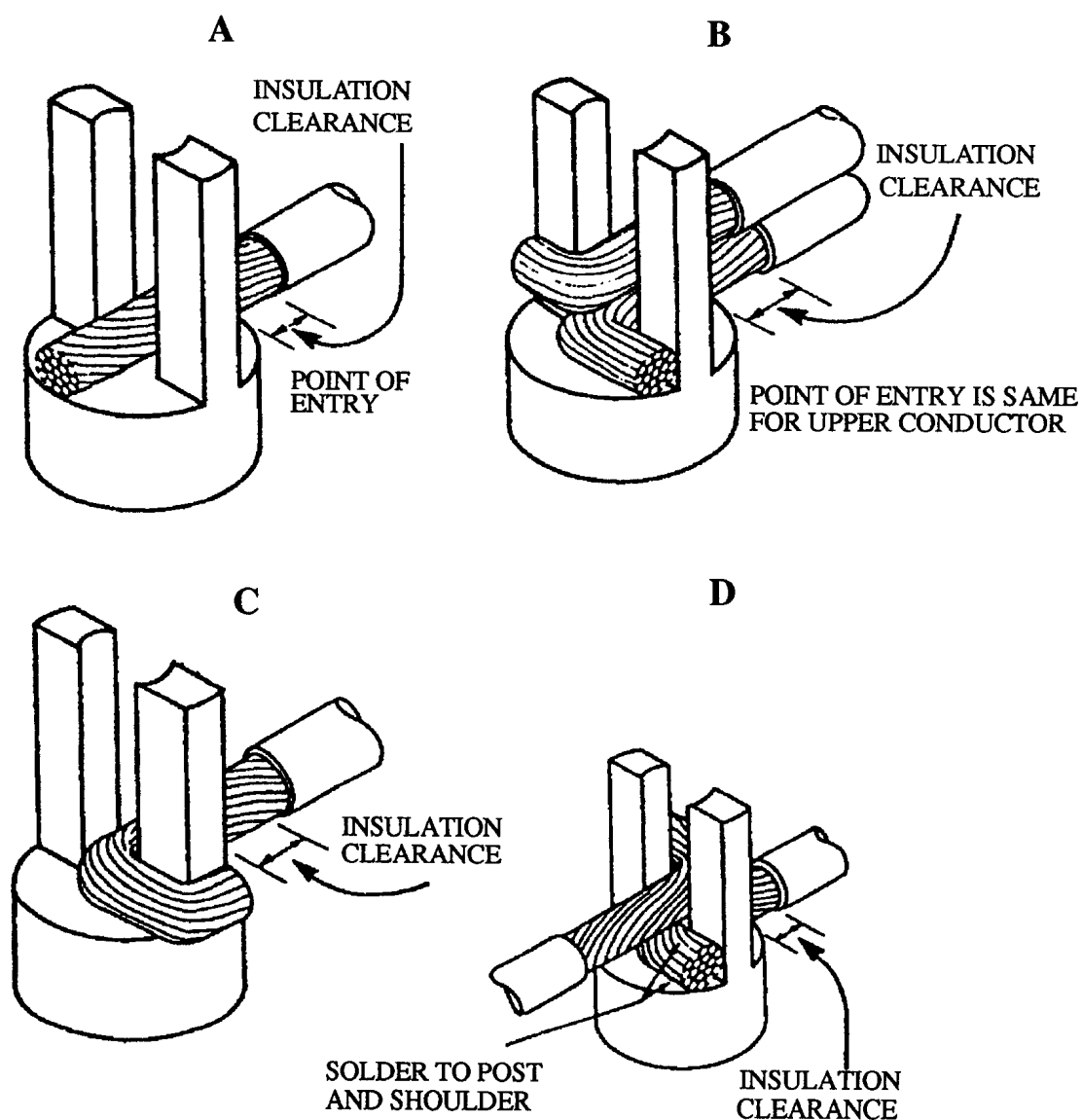


Figure 9-6. Side Route Connections to Bifurcated Terminals

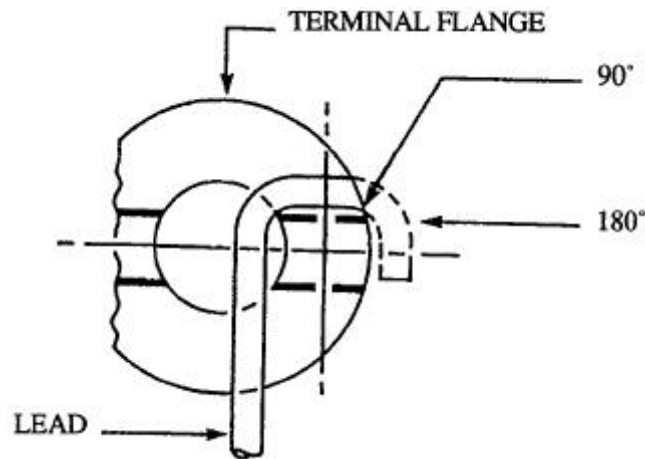


Figure 9-7. Lead Wrap

4. **Continuous Run Connections.** When a series of terminals are to be connected to each other, such interconnections shall be made with a solid wire in accordance with Figure 9-8 or 9-9. The wire shall be attached to the first and last terminal in accordance with paragraph 9.3-2.

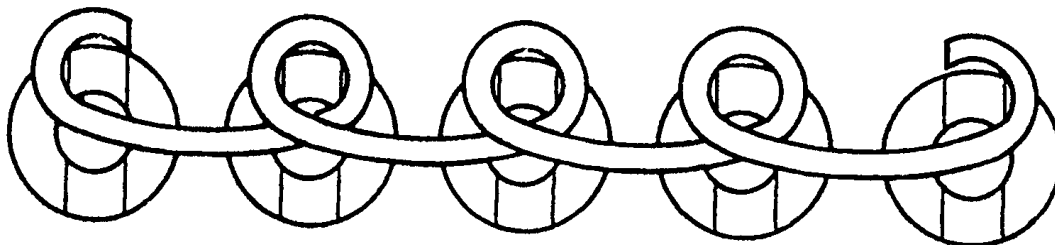


Figure 9-8. Continuous Run Wrapping--Bifurcated Terminals

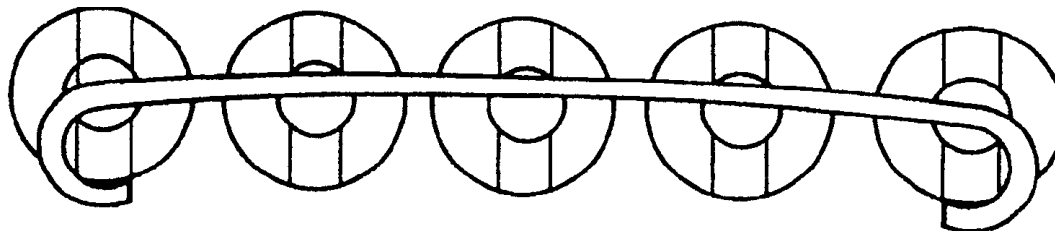


Figure 9-9. Continuous Run Wrapping--Bifurcated Terminals Alternate Procedure

9.4 Hook Terminals

Connections to hook terminals shall be as shown in Figure 9-10. The bend to attach conductors to hook terminals shall be a minimum of 1/2 turn (180°) to a maximum of 3/4 turn (270°). Protrusion of the conductor ends shall be controlled to avoid damage to the insulation sleeving. Conductors shall be wrapped directly to the terminal and not on other conductors. When more than one conductor is connected to the terminal, the direction of the bend of each additional conductor shall alternate (Figure 9-10).

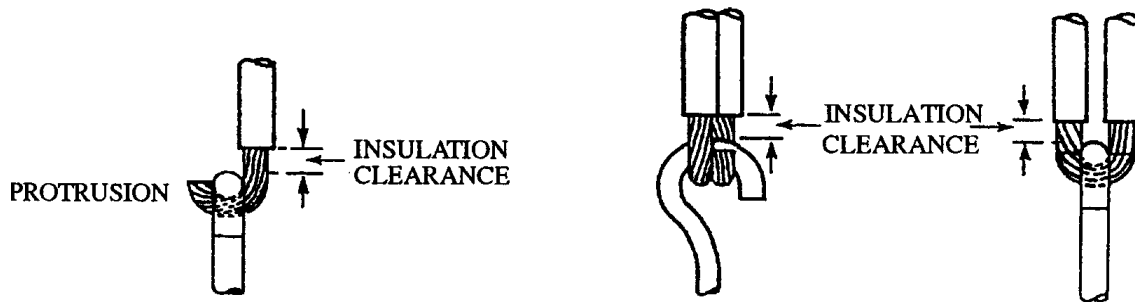


Figure 9-10. Connections to Hook Terminals

9.5 Pierced Terminals

Connections to pierced terminals shall be as shown in Figure 9-11. The bend to attach conductors to pierced terminals shall be a minimum of 1/4 turn (90°) to a maximum of 1/2 turn (180°). Protrusion of conductor ends shall be controlled to avoid damage to insulation sleeving.

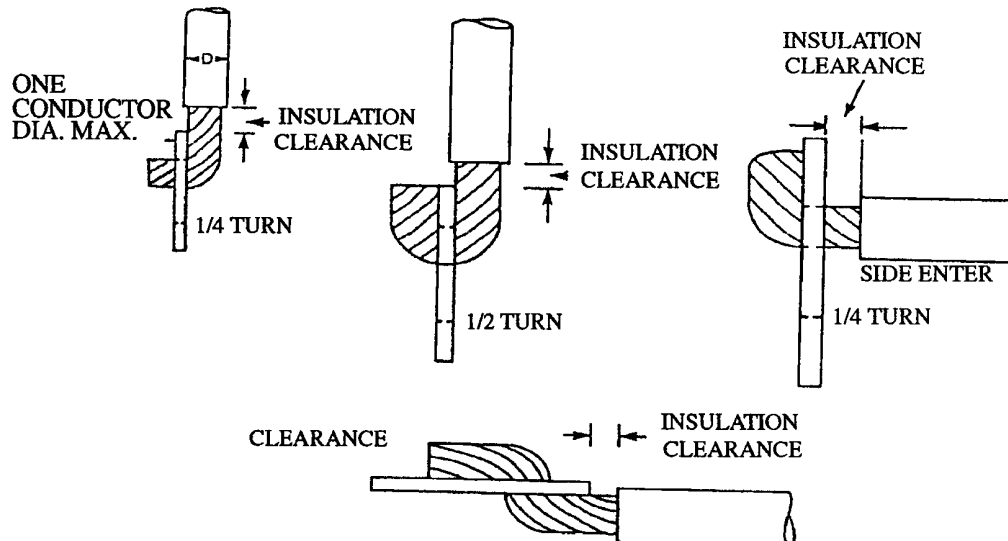


Figure 9-11. Connections to Pierced Terminals

9.6 Solder Cups (Connector Type)

Conductors shall enter the solder cup as shown in Figure 9-12. Conductors shall be bottomed in the cup and shall be in contact with the inner wall of the cup. The maximum number of conductors shall be limited to those that can be in contact with the full height of the inner wall of the cup.

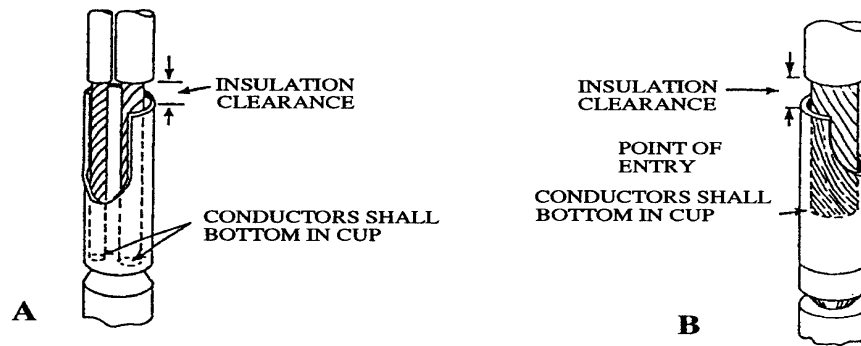


Figure 9-12. Connections to Solder Cups (Connector Type)

9.7 Solder Cups (Swaged Type)

Connections shall be as shown in Figure 9-13. Conductors entering from the top shall be in contact with the inner wall of the cup and shall bottom in the cup or on the bottom conductor.

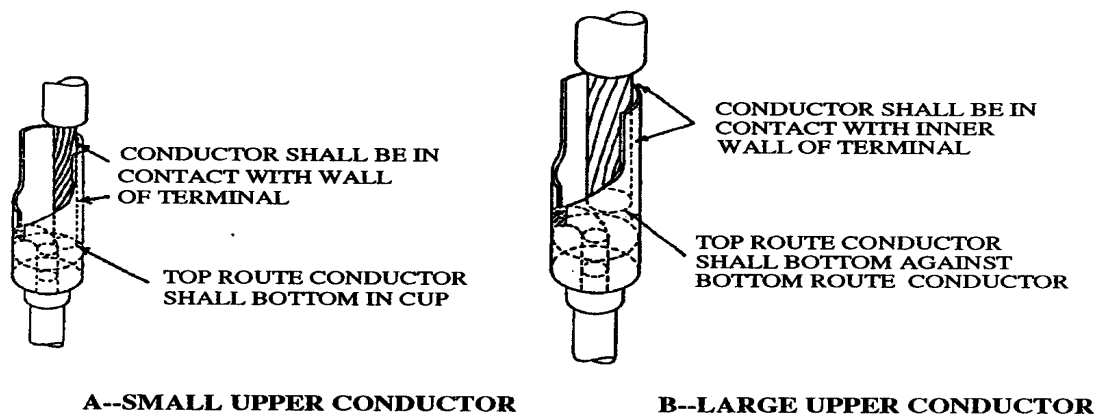


Figure 9-13. Connections to Swaged Type Solder Cup

9.8 Insulation Sleeving Application

All joints required to be covered by insulation sleeving shall be inspected prior to and after sleeving. Heat shrinkable insulation sleeving shall be used for electrical insulation, as appropriate. Where a part covered by insulating sleeving requires mechanical support, measures shall be taken to ensure that the part is not free to move within the sleeving. Material selection shall be specified on the engineering documentation. Sleeving shall not be pierced, split, charred, or otherwise damaged.

CAUTION: *EXTREME CARE SHALL BE TAKEN TO PREVENT DAMAGE TO THE ASSEMBLY DUE TO EXCESSIVE HEAT WHILE SHRINKING THE SLEEVING.*

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